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**Tropic responses.**—In working out the phototropic responses of *Avena sativa*, ARISZ<sup>10</sup> believes he has shown that the terms reaction time, presentation time, threshold of stimulation, etc., do not represent any well-determined end points in tropic responses. Quotations from his paper present his conclusions: "Each quantity of energy reacts on the plant and is expressed by a curvature of definite maximum strength." "If we once more trace how far the above investigations influence our conception of the process of stimulation, it is clear that the similarity to physico-chemical processes becomes more and more marked. The existence of a threshold of stimulation can no longer be maintained, for not only is each quantity of energy perceived, but it is clear now that a reaction will always take place. The time which intervenes between the application of the stimulus and the beginning of the curvature, the 'reaction time,' was found to be experimentally undeterminable. Thus the latter cannot serve as a measure of sensitiveness."

We are urged, then, in this stronghold of stimulus physiology (tropisms), to abandon the stimulus conception for the physico-chemical. BLACKMAN had earlier urged such a shift of viewpoint in the study of metabolic processes of plants.—WILLIAM CROCKER.

**The cytology of rice.**—Since closely related species or even races of a given species may show differences in chromosome characters, several races of rice (*Oryza sativa*) were selected by KUWADA<sup>11</sup> for a cytological study. Just before synapsis in the pollen mother cell, a number of chromatin masses, about equal to the diploid number of chromosomes, are found scattered throughout the nuclear cavity. The masses, which are constantly paired, stretch out into double threads, which remain double during synapsis, but fuse after the synaptic stage is past. Soon after synapsis, the single thread arising from the fusion again becomes double and segments into 12 bivalent chromosomes, or gemini, and throughout the prophase the two parts of the bivalent chromosomes remain in parallel association, while they become shorter and thicker. Even in the homotypic division paired chromosomes, forming pseudogemini, occur. In the diploid generation the chromosomes are always paired and the number is 24. The development of the embryo sac presents nothing unusual. There are at first three antipodals, but, as in other Gramineae, the number becomes much larger at a later stage in the development.—CHARLES J. CHAMBERLAIN.

**Physics of transpiration.**—RENNER<sup>12</sup> has already shown that in still air evaporation from surfaces of like shape but different size varies more nearly

<sup>10</sup> ARISZ, W. H., On the connection between stimulus and effect in phototropic curvatures of seedlings of *Avena sativa*. Reprint from Proc. Konink. Akad. Wetensch. Amsterdam. March 25, 1911.

<sup>11</sup> KUWADA, YOSHINARI, A cytological study of *Oryza sativa* L. Bot. Mag. Tokyo 24:267-281. pl. 8. 1910.

<sup>12</sup> Rev. in BOT. GAZ. 51:156. 1911.